ABSTRACT

THE ECOPHYSIOLOGY OF BACTERIOPHAGE INFECTING HALOPHILIC ARCHAEBACTERIA

Larry Luparker Daniels

An ecophysiological study of halophages, isolated from the Yallahs Salt Ponds, Jamaica, has been performed to determine (i) what effect, if any, the single most important environmental parameter, salinity, has on phage-bacterium interactions, and (ii) which phage functions and phage-bacterium interactions are most likely to be of long term significance to the co-existence of halophage and halobacteria in nature. Results indicate that the NaCl concentration governs the interactions between halophages and the extremely halophilic strains of Halobacterium. Phage growth is invariably attenuated at high salinity. A more detailed study on a single phage isolate, S5100, shows that at high salinities the maturation of phage is repressed, and lytic phage infections give way to persistent infections.

In most instances, the frequency of productive infections initiated by each phage on each sensitive

host strain is a consistent function of the host rather than the phage. Closer inspection revealed that the intracellular stages of the phage infection process have a higher degree of host specificity than the cellular receptor sites.

It has been demonstrated that mutations to higher virulence and/or extended host range occur in the morphological group A1 phages. Phage adsorption is implicated as the stage of the phage infection process that is affected by these mutations.

The group B1 halophage, S45, is restricted and modified *in vivo* by strains of *Halobacterium*. Three strain-specific activities have been observed. Two of these occur in the same bacterial strain and appear to be due to different kinds of enzymatic activities. One of the restriction specificities is shown to be associated with a strain-specific endonuclease active on unmodified halobacterial DNA.

These phenomena that have been observed are discussed with respect to possible implications for phage ecology and evolution.